

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

REC'D 17 MAY 2006

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| Applicant's or agent's file reference P 03 111 WO | FOR FURTHER ACTION <div style="text-align: right;">See Form PCT/PEA/416</div> | |
| International application No. PCT/DK2004/000055 | International filing date (<i>day/month/year</i>) 26.01.2004 | Priority date (<i>day/month/year</i>) 26.01.2004 |
| International Patent Classification (IPC) or national classification and IPC INV. F03D11/00 | | |
| Applicant VESTAS WIND SYSTEMS A/S et al | | |
| 1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36. 2. This REPORT consists of a total of 8 sheets, including this cover sheet. 3. This report is also accompanied by ANNEXES, comprising: a. <input checked="" type="checkbox"/> <i>sent to the applicant and to the International Bureau</i> a total of 6 sheets, as follows: <input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions). <input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box. b. <input type="checkbox"/> (<i>sent to the International Bureau only</i>) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions). | | |
| 4. This report contains indications relating to the following items: <div style="margin-left: 20px;"> <input checked="" type="checkbox"/> Box No. I Basis of the report <input type="checkbox"/> Box No. II Priority <input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability <input type="checkbox"/> Box No. IV Lack of unity of invention <input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement <input type="checkbox"/> Box No. VI Certain documents cited <input checked="" type="checkbox"/> Box No. VII Certain defects in the international application <input checked="" type="checkbox"/> Box No. VIII Certain observations on the international application </div> | | |
| Date of submission of the demand 28.11.2005 | Date of completion of this report 16.05.2006 | |
| Name and mailing address of the international preliminary examining authority: <div style="display: flex; align-items: center;"> <div> European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016 </div> </div> | Authorized officer Steinhauser, U Telephone No. +31 70 340-4171 | |



**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/DK2004/000055

Box No. I Basis of the report

1. With regard to the **language**, this report is based on
- ☒ the international application in the language in which it was filed
 - ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of:
 - ☐ international search (under Rules 12.3(a) and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4(a))
 - ☐ international preliminary examination (under Rules 55.2(a) and/or 55.3(a))
2. With regard to the **elements*** of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

Description, Pages

1-23 as originally filed

Claims, Numbers

1-36 filed with telefax on 28.11.2005

Drawings, Sheets

1/10-10/10 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to sequence listing (*specify*):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to sequence listing (*specify*):

* If item 4 applies, some or all of these sheets may be marked "superseded."

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Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | |
|-------------------------------|-------------|-------------------------------|
| Novelty (N) | Yes: Claims | 8 10 20 25-30 33 |
| | No: Claims | 1-7 9 11-19 21-24 31 32 34-36 |
| Inventive step (IS) | Yes: Claims | 8 10 25-30 |
| | No: Claims | 1-7 9 11-24 31-36 |
| Industrial applicability (IA) | Yes: Claims | 1-36 |
| | No: Claims | |

2. Citations and explanations (Rule 70.7):

see separate sheet

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item V

**Reasoned statement with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

1 Reference is made to the following documents:

D1: DE 102 25 025 A (WOBBEN ALOYS) 24 December 2003 (2003-12-24)

D2: DE 102 00 401 A (WOBBEN ALOYS) 24 July 2003 (2003-07-24)

D3: US 2003/175089 A1 (ALMIND PREBEN) 18 September 2003 (2003-09-18)

Independent claims 1, 11, 31 and 34-36

2 The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of independent claim 1 is not new in the sense of Article 33(2) PCT.

2.1 Document D1 discloses (the references in parentheses applying to this document) a method of handling a wind turbine blade during transport of the blade whereby the method consists of the following steps:

- establishing a mounting hole penetrating the surface of the blade,
- mounting handling means (10,12,32) including mounting means (30) in at least one hole and
- subsequently handling the wind turbine blade by said handling the means on the wind turbine blade where said handling means (32) are forced against the surface of the blade by said mounting means. (see § 0018,0035-0039, claim 13 of D1 and figs. 4 and 5).

The subject-matter of claim 1 is therefore not new (Art. 33(2) PCT).

The same argumentation is applicable in view of the disclosure of D2 which also discloses a method of handling a wind turbine blade during transport of the blade. From the teaching of D2 (see § 0016, claims 2 and 5) it becomes evident that the method as disclosed also falls under the wording of present claim 1.

The subject-matter of claim 1 is therefore also not new in view of D2 (Art. 33(2) PCT).

2.2 D1 also discloses a handling system (10) for handling a wind turbine blade during

transport whereby the system itself (see the comments regarding this point in section RE ITEM VIII) comprises handling means (10,12,32) to be positioned in use on the surface of the wind turbine blade that comprise a surface (32) that partly corresponds in shape to the section of the wind turbine blade that it covers and mounting means (30) to be mounted in the hole.

The subject-matter of claim 11 is therefore not new (Art. 33(2) PCT).

The same argumentation is applicable in view of the disclosure of D2 which deprives the subject-matter of claim 11 of novelty (Art. 33(2) PCT).

- 2.3 D1 also discloses handling means for a wind turbine blade during transport whereby the handling means themselves (see the comments regarding this point in section RE ITEM VIII) comprise at least one surface (32) substantially corresponding in shape to the section of the wind turbine blade that the handling means covers.

The subject-matter of claim 31 is therefore also not new in view of D1 (Art. 33(2) PCT).

A similar argumentation is applicable in view of the disclosure of document D2 which deprives the subject-matter of claim 31 of novelty (Art. 33(2) PCT)..

The technical features of independent claim 33 are also disclosed by the same document D1.

Finally the disclosure of D1 and D2 also anticipate the subject-matter of independent use claims 34-36 which are therefore considered to lack novelty with regard to these documents (Art. 33(2) PCT).

- 3 Dependent claims 4-7,12-17,20,32 and 33 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step, because the subject-matter of claims 4-7,12,13,17 and 32 is disclosed by the documents D1 or D2 directly. The features of dependent claims 14-16 are known from D2 or comprise only minor variations to the handling system of D2 which lie within the discretion of the skilled person.

In the case of claims 20 and 33, the technical feature of high friction material is well

established in the technical area of wind turbine blade handling systems/means that the integration of such a feature is a straightforward measure the skilled man would consider without being inventive. Since this feature has been used already (see D3, fig. 12 and § 0056) it would be obvious for the skilled person to apply such a feature with corresponding effect to a handling system/means.

Independent claims 8 and 25

- 5 The subject-matter of independent claims 8 and 25 is neither known, nor rendered obvious by, the available prior art. The reasons are as follows: the embodiments of these claims pertain to a method of manufacturing a wind turbine blade (claim 8) and a wind turbine blade (claim 25). The wind turbine blade is manufactured by reinforcing the hole area of the inner surface of at least one of the shells by applying further layers of material.
- Since such a method and a wind turbine blade comprising at least one hole area with one or more reinforcement layers on the inner surface of the blade are not disclosed by the state of the art documents. The subject-matter of independent claims 8 and 25 appears to be in compliance with Art. 33 (2)-(4) PCT.

- 5.1 Claims 10 and 26-30 depend on claim 8 and claim 25 respectively and hence their subject-matter also complies with Art. 33 (2)-(4) PCT.

Re Item VII

Certain defects in the international application

- 1 Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1 and D2 is not mentioned in the description, nor are these documents identified therein.

Re Item VIII

Certain observations on the international application

- 1 It is remarked that the following claims do not comply with Art. 6 PCT for the following reasons.

- 1.1 Although claims 11 and 31 have been drafted as separate independent claims of the same category, they appear to relate effectively to the same subject-matter and to differ from each other only with regard to the definition of the subject-matter for which protection is sought and in respect of the terminology used for the features of that subject-matter. The aforementioned claims therefore lack conciseness and as such do not meet the requirements of Article 6 PCT. Furthermore claim 11 also contains subject-matter (at least one mounting hole (22) penetrating the surface of the blade) that is not part of the handling system but part of the blade. The same objection is raised against the subject-matter of claim 31 which also contains subject-matter (one or more mounting holes for fastening means (11-14) fastening said handling means to the surface of the wind turbine blade by using at least one hole in the wind turbine blade) that does not form part of the handling means.
- 1.2 Although claims 34-36 have been drafted as separate independent claims of the same category, they appear to relate effectively to the same subject-matter and to differ from each other only with regard to the definition of the subject-matter for which protection is sought and in respect of the terminology used for the features of that subject-matter. The aforementioned claims therefore lack conciseness and as such do not meet the requirements of Article 6 PCT.
- 1.3 Dependent claim 2 pertains to a method by which a hole is manufactured into the blade rather than further defining the handling method the blade itself. This claim is not therefore suitable to further characterize the method of claim 1. The same objection arises in view of dependent claim 9.
- 1.4 Dependent claim 3 pertains to marking the blade with visual signs indicating the location of the hole. It remains unclear to what extent this is essential for the handling method as such.
- 1.5 Further doubt about the intended scope of protection is raised in view of dependent claims 18, 19, 21, 22, and 24 (turbine blade is not part of the handling system and hence a characterization of the handling system by features of the blade is not meaningful).

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(SEPARATE SHEET)**

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- 2 According to the requirements of Rule 10.2 PCT, the terminology and the signs shall be consistent throughout the application. This requirement is not met in view of the description which refers to figs. 6a and 6b while the drawing sheet 7/10 shows only a single fig. 6.

Claims

1. Method of handling a wind turbine blade at least during storage, transport or mounting of the blade, said method comprising the steps of:
5 establishing at least one mounting hole penetrating the surface of the blade,
mounting one or more handling means including mounting means in said at least one hole, and
10 handling the wind turbine blade by at least said handling means on the wind turbine blade where said one or more handling means are forced against the surface of the blade by said mounting means.
- 15 2. Method according to claim 1, wherein said at least one mounting hole is established by a drilling process.
3. Method according to claim 1 or 2, wherein said at least one mounting hole is marked with visual signs indicating the location of the hole e.g. visual lines or
20 circles on the surface of the blade.
4. Method according to any of claims 1 to 3, wherein said mounting includes entering said mounting means through the blade.
- 25 5. Method according to any of claims 1 to 4, wherein said handling means are connected to handling rods, plates or walls.
6. Method according to any of claims 1 to 5, wherein the connection to said handling rods, plates or walls is established by use of bolts, thread bars, welding
30 means or the like.

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7. Method according to any of claims 1 to 6, wherein the blade is handled at least by the suspension points established by said handling means.

5 8. Method of manufacturing a wind turbine blade to be handled, said method comprising the steps of:

manufacturing at least a first and second shell of a wind turbine blade,

10 reinforcing at least one hole area of the inner surface of at least one of said shells by applying further layers of material, and

establishing at least one hole penetrating the surface at said at least one hole area.

15 9. Method according to claim 8, wherein said at least one mounting hole is established by a drilling process.

20 10. Method according to claim 8 or 9, wherein said at least one mounting hole is marked with visual signs indicating the location of the hole e.g. visual lines or circles on the surface of the blade.

25 11. Handling system for handling a wind turbine blade (5) at least during storage, transport or mounting of the blade, said system comprising

at least one mounting hole (22) penetrating the surface of the blade,

one or more handling means (9, 9a, 9b, 29, 29a, 29b) to be positioned on the surface of the wind turbine blade and including a surface substantially or partly corresponding in shape to the section of the wind turbine blade that it covers, and

30 mounting means (11-14) to be mounted in said at least one hole.

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12. Handling system according to claim 11, where said handling means (9, 9a, 9b, 29, 29a, 29b) are connected to a handling structure such as handling rods (24), handling plates and/or handling walls (25) e.g. of a transport container.
- 5 13. Handling system according to any of claims 11 or 12, where said handling means (9, 9a, 9b, 29, 29a, 29b) are made in metal such as steel plate, in glass fiber reinforced plastic materials alone or glass fiber reinforced plastic materials reinforced with carbon fiber or aramid.
- 10 14. Handling system according to any of claims 11 to 13, where said system comprises two handling means (9, 9a, 9b, 29, 29a, 29b, 30) positioned on opposite side of the wind turbine blade.
- 15 15. Handling system according to claim 14, where said two handling means (9, 9a, 9b, 29, 29a, 29b, 30) directly or indirectly are connected by the mounting means (11-14, 26a, 26b, 28).
- 20 16. Handling system according to claim 14 or 15, where two flanges (27) are fastened to opposite ends of the handling means (29, 29a, 29b, 30) and establish the connection points for the mounting means (26a, 26b, 28).
- 25 17. Handling system according to any of claims 11 to 16, where said mounting means (11-14, 26a, 26b, 28) is one or more bolts (11, 13) or thread bars (26a, 26b) with corresponding nuts (12, 14, 28).
- 30 18. Handling system according to any of claims 11 to 17, where said mounting means goes through the wind turbine blade next to the beam (16) or any other strengthening structure in the blade e.g. close to the end of the beam at the tip of the wind turbine blade.

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19. Handling system according to claim 18, where two of said mounting means (11, 13, 26a, 26b) go through the blade on opposite side of said beam (16) or any other strengthening structure in the blade.
- 5 20. Handling system according to any of claims 11 to 19, where one or more of the surfaces of said handling means comprise a high friction material (18) such as rubber.
- 10 21. Handling system according to any of claims 11 to 20, where said blade comprises at least one hole area with one or more reinforcement layers (19) on the inner surface of the blade (5).
- 15 22. Handling system according to claim 21, where said reinforcement layers (19) comprise glass fiber reinforced plastic materials alone or reinforced with carbon fiber or aramid.
23. Handling system according to any of claims 11 to 22, where the length of said blade is at least 30 meters such as approximately 39, 44 or 49 meters or more.
- 20 24. Handling system according to any of claims 11 to 23, where the weight of said blade is at least 6000 kilogram such as 6000 to 7500 kilogram e.g. approximately 6400, 6800 or 7200 kilogram.
- 25 25. Wind turbine blade (5) to be handled at least during storage, transport or mounting, said blade comprising at least one hole area with one or more reinforcement layers (19) on the inner surface of the blade and at least one hole (22) where said at least one hole (22) penetrates the surface of the blade at the hole area.

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26. Wind turbine blade according to claim 25, where said reinforcement layers (19) comprise glass fiber reinforced plastic materials alone or reinforced with carbon fiber or aramid.

5 27. Wind turbine blade according to claim 25 or 26, where the surface of said at least one hole area includes visual signs indicating the location of the at least one hole e.g. visual lines or circles.

10 28. Wind turbine blade according to any of claims 25 to 27, where one or more of said at least one hole is part of the lightning protection system of the blade e.g. lightning receptor holes.

15 29. Wind turbine blade according to any of claims 25 to 28, where the length of said blade is at least 30 meters such as approximately 39, 44 or 49 meters or more.

30. Wind turbine blade according to any of claims 25 to 29, where the weight of said blade is at least 6000 kilogram such as 6000 to 7500 kilogram e.g. approximately 6400, 6800 or 7200 kilogram.

20 31. Handling means (9, 9a, 9b) for a wind turbine blade at least during storage, transport or mounting, said handling means comprising

at least one surface substantially corresponding in shape to the section of the wind turbine blade that the handling means covers (5), and

25 one or more mounting holes for fastening means (11-14) fastening said handling means to the surface of the wind turbine blade by using at least one hole in the wind turbine blade.

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32. Handling means according to claim 31, where said means are made in metal such as steel plate, in glass fiber reinforced plastic materials alone or glass fiber reinforced plastic materials reinforced with carbon fiber or aramid.

5 33. Handling means according to claim 31 or 32, where one or more of the surfaces of the handling means comprise a high friction material (18) such as rubber.

34. Use of a handling system according to any of claims 11 to 24 in connection with transport of one or more wind turbine blades, in transport containers or similar
10 equipment for transport of wind turbine blades such as trolley vehicles.

35. Use of handling means according to claim 31 to 33 in connection with transport of one or more wind turbine blades, in transport containers or similar equipment for transport of wind turbine blades such as trolley vehicles.

15 36. Use for a method of handling a wind turbine blade according to claims 1 to 8 in connection with transport from the place of manufacturing to the site of the wind turbine and/or subsequent transport away from the site of the wind turbine.